Response under 37 C.F.R. 1.116
- Expedited Examining Procedure -
Examining Group 2612

MAIL STOP AF
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Customer No. 01333

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Joseph R. Summa

OPTIMIZATION OF CCD MICROLENS SIZE FOR COLOR BALANCING

Serial No. 09/821,151

Filed 29 March 2001

Group Art Unit: 2612

Examiner: Nguyen, Luong Trung

I hereby certify that this correspondence is being deposited today with the United States Postal Service as first class mail in an envelope addressed to Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Lois A. Massar

Aug. 15, 2005
Date

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

ENTERED

Sir:

DECLARATION UNDER 37 CFR 1.132

Peyton C. Watkins declares that:

1. an invention summary was prepared by Joseph R. Summa on March 17, 2000 (see attached Appendix A);

2. that the invention summary was sent to the Patent Legal Staff and that Joseph R. Summa was notified on April 25, 2000 by the Patent Legal Staff that a Kodak docket number had been assigned and that the responsible attorney would be James D. Leimbach (see attached Appendix B);

3. that James D. Leimbach left the Eastman Kodak Company on June 16, 2000;

4. the docket for the invention summary submitted by Joseph Summa was transferred to Tom Close, and that Tom Close also received responsibility for all the dockets for which James D. Leimbach was responsible in addition to his dockets that he was already responsible;

5. that Tom Close filed 59 US Patent applications in 2000 in processing the cases for which he was responsible (see attached Appendix C);

6. I came back to the Patent Legal Staff, after an assignment, in October 2000 and that the docket for the invention summary prepared by Joseph R. Summa was assigned to me in addition to all other dockets for which original responsibility was James D. Leimbach and which were not completed by Tom Close;

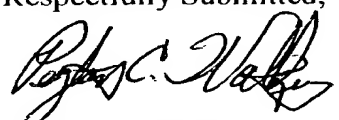
7. that I personally met with Joseph R. Summa in preparing the patent application for the subject invention;

8. that the actual dates on which the meetings occurred have been deleted from my calendar due to Eastman Kodak Company's policy of automatically deleting electronic calendar entries after 45 days;

9. that I filed 33 US Patent applications in 2001 including the subject invention and that I had one US Patent application prepared by outside counsel in 2001 in order to process the backlog of cases for which I was responsible (see attached Appendix D).

I further declare that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully Submitted,



Peyton C. Watkins

Appendix A

Optimization of CCD Microlens Size for Color Balancing

Joseph R. Summa

Field of Invention

This invention relates to electronic imaging, and in particular the color sensitivity of individual pixels in a CCD.

Background of Invention

The responsivity of a CCD typically varies with the wavelength of the incident light. This variation is caused by a variety of factors including the gate electrode and dielectric stack, color filter non-idealities, and the sensitivity of the silicon itself. Typically, the spectral response of a CCD peaks in the green and is lowest in the blue. There is also much less blue light available in typical scenes making larger sensitivity to blue light desireable. This invention preferentially directs portion of the light that would otherwise be captured by pixel with high responsivity onto a pixel with lower response and thus permit optimization of the total spectral sensitivity of the device.

Summary of the Invention

Microlens arrays deployed on CCDs are typically sized identically for each color and match the dimension (less the gap between lenses) of the underlying pixel. By uniquely sizing the microlenses over each color, (and expanding outside the bounds of the underlying pixel if necessary), the spectral response of the device can be customized.

Advantages over Prior Art

* Improved color balance without significant loss of light
* Improved blue response
* Less sensitivity to lens inefficiencies when applied to a full frame CCD

Detailed Description of the Invention

A typical lens array is shown in figure 1. An example of a resized lens array is shown in figure 2. In the (somewhat exaggerated) case shown, an oversized blue lens focuses a percentage of the light that would have been collected in the green pixel using the standard design in figure 1. This additional light can be used to compensate for spectral sensitivity differences. Due to changes in the curvature of the lens as function of lens size, not all lenses will focus light on the substrate with equal efficiency. When applied to an interline CCD with a narrow photodiode, this will reduce the quantum efficiency of these pixels, but still improve color balancing. In the case of full frame image sensors (where the entire pixel is photosensitive), these losses (if any) will be much less severe since the diameter of the focus spot of the lens is less critical.

Examples of Prior Art:

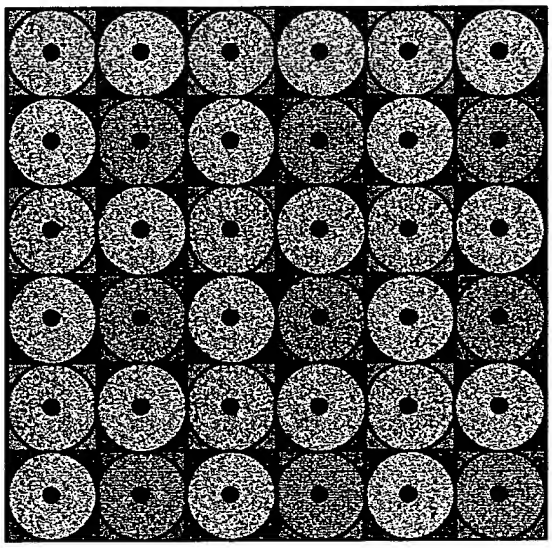
US PAT. 4,667,092 ← USE OF LENSLETS

US PAT. 6,001,668 (KODAK) ← ITO FULL FRAME SENSOR w/ MENTION OF LENSLET TO FOCUS LIGHT INTO ITO PHASE

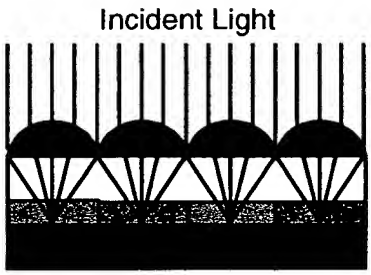
3/17/2000 R. Summa

3/17/2000 Joseph Summa

Attachments

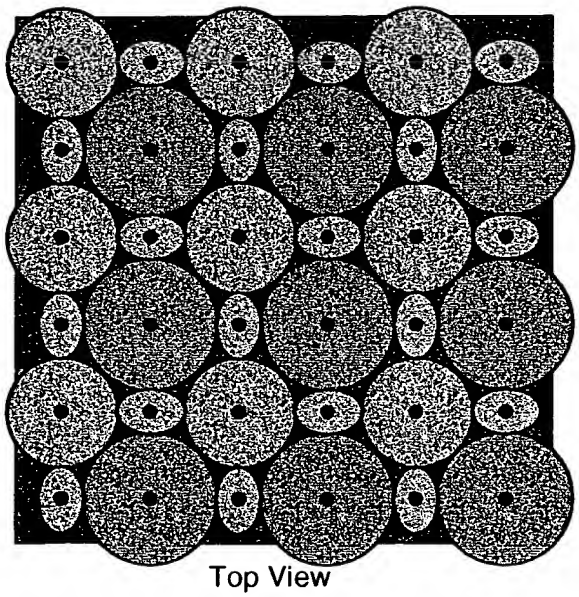


Top View

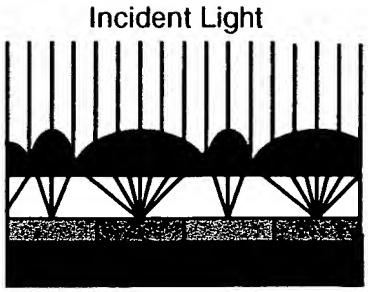


Cross Sectional View

Figure 1



Top View



Cross Sectional View

Figure 2

3/17/2000

Lois A. Massar 04/25/2000 02:03:36 PM

Appendix B

Lois A. Massar
04/25/2000 01:56 PM

To: Joseph R Summa/470596/EKC@Kodak
cc: David N. Nichols/121334/EKC@Kodak, James D. Leimbach/484573/EKC@Kodak (bcc: Lois A. Massar/315487/EKC)
Subject: Docket Assignment - Docket No. 81017/JDL

From: Lois A. Massar

SUBJECT: **Newly Received "KODAK Invention Disclosure"**
Titled: "Optimization of CCD Microlens Size For Color Balancing"
Inventor(s): Joseph R. Summa
Docket No.: 81017/JDL

The above-identified "KODAK Invention Disclosure" has been assigned to James D. Leimbach for handling.

The Patent Department Docket No. indicated above should always be used when corresponding to us regarding this invention disclosure.

When you are ready to discuss the patentability of this invention, please contact me and I will schedule a meeting between you and Mr. Leimbach. If you have any questions or concerns, please contact either Mr. Leimbach (x-29021) or myself (x-29711). Also, please keep us informed of any significant changes in the invention or plans to use the invention.

Thank you.

Lois A. Massar

Patent Legal Staff, 14/83/RL, MC-02201, x-29711
Patent Legal Assistant to James D. Leimbach

Appendix C

IMAGING ELECTRONICS

Final

December 2000

Work Load	THC	CEB	MGB	PRC	WFN	RLO	SLP	DMW	SHS	PCW	-	-	-	JDL	Total	Av.
Domestic PE Pending	10	12	17	6	7	14	1	18	14	17					116	12
PE Over 6 Months	0	1	0	0	0	0	0	2	2	0					5	1
Attorney Ready PE	0	1	0	0	1	0	0	5	3	0					10	1
Foreign PE Pending	0	0	0	1	0	0	0	0	0	0					1	0
CL Pending	11	0	13	19	13	0	7	17	0	19					99	10
Originating Country Appln Pending	123	93	48	66	109	221	27	118	44	79					928	93
EP Appln Pending	33	60	79	27	139	166	37	70	15	58					684	68
JP Appln Pending	52	82	142	66	239	204	55	92	17	67					1016	102
Other Foreign Appln	7	7	14	6	44	69	24	12	7	42					232	23
Input	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**		**JDL**	**Total**	
Domestic PE Received	1	0	0	0	2	1	0	0	0	1					5	1
Foreign PE Received	0	0	0	0	0	0	0	0	0	0					0	0
CL Received	0	0	0	0	5	0	0	0	0	0					5	1
Output	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**		**JDL**	**Total**	
Disposed by Filing	4	6	3	0	10	3	0	8	2	4					40	4
Other Disposals	0	0	0	0	0	0	0	0	0	0					0	0
Priority Appln Filed	4	6	4	0	9	3	0	8	2	4					40	4
US Original Appln Filed	4	6	3	0	10	3	0	7	2	5					40	4
Prepared Outside	0	0	0	0	0	0	0	7	0	0					7	1
US Other Appln	1	0	0	2	2	2	0	0	1	1					9	1
CL Answer	0	0	0	0	0	0	0	1	0	0					1	0
US Patents Issued	2	1	2	0	2	4	1	3	1	1					17	2

Year to Date

Input YTD	THC	CEB	MGB	PRC	WFN	RLO	SLP	DMW	SHS	PCW	-	-	-	JDL	Total	Av.
Domestic PE Received	43	14	25	14	16	40	0	68	6	2				7	228	23
Foreign PE Received	0	1	0	4	12	1	0	0	0	0				0	18	2
CL Received	9	0	4	0	26	0	0	36	0	2				1	77	8
Output YTD	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**		**JDL**	**Total**	**Av.**
Disposed by Filing	56	36	22	12	37	83	0	56	12	9				7	323	32
Other Disposals	9	13	1	16	5	2	0	23	0	1				4	70	7
Priority Appln Filed	59	36	22	8	37	85	0	56	9	9				6	321	32
US Original Appln Filed	63	36	21	13	38	84	2	55	11	10				6	333	33
Prepared Outside	0	1	0	0	0	1	0	10	0	1				0	13	1
US Other Appln	7	11	9	15	12	8	11	2	1	2				17	78	8
CL Answer	8	7	7	4	2	0	0	20	0	2				10	50	5
US Patents Issued	19	26	27	20	43	82	16	26	8	8				13	275	28
Input-Output	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**		**JDL**		**Av.**
PE	-22	-35	2	-14	-26	-45	0	-11	-6	-8				-4	-165	-17
CL	1	-7	-3	-4	24	0	0	16	0	0				-9	27	3

Appendix D

IMAGING ELECTRONICS

December 2001

Final

Work Load	THC	CEB	MGB	PRC	WFN	RLO	SLP	DMW	SHS	PCW	-	-	-	-	Total	10 Av.
Domestic PE Pending	15	10	24	4	18	28	12	8	10	29					158	16
PE Over 6 Months	0	0	0	0	1	0	0	1	0	0					2	0
Attorney Ready PE	2	0	0	0	1	0	0	1	0	0					4	0
Foreign PE Pending	0	0	0	0	0	0	0	0	0	0					0	0
CL Pending	14	5	9	23	16	0	7	12	4	20					110	11
Originating Country Appln Pending	134	62	56	70	93	243	44	147	34	100					983	98
EP Appln Pending	59	45	68	22	131	223	29	92	17	74					760	76
JP Appln Pending	77	64	103	61	225	272	54	109	20	82					1067	107
Other Foreign Appln	23	37	7	5	37	142	18	12	6	38					325	33
Input	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**	**-**	**-**	**Total**	**Av.**
Domestic PE Received	4	0	1	0	0	2	0	0	0	1					8	1
Foreign PE Received	0	0	0	0	0	0	0	0	0	0					0	0
CL Received	0	0	0	2	1	0	0	0	0	0					3	0
Output	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**	**-**	**-**	**Total**	**Av.**
Disposed by Filing	3	10	7	0	2	12	3	2	4	1					44	4
Other Disposals	0	0	0	0	0	0	0	0	0	0					0	0
Priority Appln Filed	3	10	7	0	2	13	3	2	4	2					46	5
US Original Appln Filed	3	10	7	0	2	12	3	3	4	2					46	5
Prepared Outside	0	0	0	0	0	0	0	0	0	0					0	0
US Other Appln	0	0	0	0	0	0	0	0	0	0					0	0
CL Answer	0	0	0	0	0	0	0	0	0	0					0	0
US Patents Issued	0	1	1	1	1	3	1	0	1	2					11	1
Month	12	12	24	12	36	24	36	24	12	12						
Year to Date																
Input YTD	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**	**-**	**-**	**Total**	**Av.**
Domestic PE Received	38	8	29	2	16	43	15	37	2	37					227	23
Foreign PE Received	0	0	0	0	0	0	0	0	0	0					0	0
CL Received	3	5	11	4	13	0	5	16	0	7					64	6
Output YTD	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**	**-**	**-**	**Total**	**Av.**
Disposed by Filing	51	19	21	3	18	99	21	42	12	37					323	32
Other Disposals	1	5	3	1	3	7	0	16	7	15					58	6
Priority Appln Filed	50	19	22	1	19	101	21	39	12	33					317	32
US Original Appln Filed	51	19	22	5	19	100	21	44	12	34					327	33
Prepared Outside	2	0	0	1	0	0	0	11	0	1					15	2
US Other Appln	4	7	4	16	12	11	3	3	9	9					78	8
CL Answer	4	0	14	1	6	0	8	9	0	7					49	5
US Patents Issued	14	32	19	9	34	65	12	20	19	25					249	25
Input-Output	**THC**	**CEB**	**MGB**	**PRC**	**WFN**	**RLO**	**SLP**	**DMW**	**SHS**	**PCW**	**-**	**-**	**-**	**-**	**Total**	**Av.**
PE	-14	-16	5	-2	-5	-63	-6	-21	-17	-15					-154	-15
CL	-1	5	-3	3	7	0	-3	7	0	0					15	2